Teaching for Understanding: "Getting Into Your Students' Minds"

Chapter Four

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Consider the following problematic snippets of various lessons:

> **Second Grade—Plant Growth**
> *A second-grade teacher, charged with teaching the key factors in healthy plant growth, leads a kinesthetic exercise in which some students pretend to be plants growing and blooming while other students pretend to be the sun and rain and soil. The teacher then gives each student a bean, some dirt, and a cup, and they plant their seeds and put the cups in the window. For closing, the teacher has the students predict what will happen to the bean, and all of the students predict that it will grow into a plant.*
>
> **Ninth Grade—Models of the Atom**
> *The objective in a ninth grade physics class is: "The student will be able to describe the evolution of our understanding of the atom." The teacher gives an engaging lecture with visual aids explaining Dalton, Rutherford, and Bohr's models of the atom. On the teachers' "exit slips" (daily closure quizzes that he uses to check for understanding), when asked to summarize the evolution of our understanding of the atom, all of the students simply drew the three models.*
>
> **Fifth Grade—How Planes Fly**
> *A fifth grade student asks her teacher, "How do planes fly?" The teacher, pleased that the student is asking such great questions, explains, "The shape of the wing, with the curved top side, forces air molecules more quickly across the top of the wing than the bottom. This leads to lower pressure on top of the wing, in essence creating a vacuum so that the plane is pulled upward. That's a great question!"*

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Although each of these scenarios contains some elements of good teaching, in each case the instruction is fundamentally flawed because the students did not learn what they were supposed to learn.

What happened? Why were these "lessons" unsuccessful? These faulty lessons represent a closely-related series of problems that sometimes undermine new teachers' effectiveness.

- In the first scenario, the teacher shows students a concept (plant growth) *without explicitly breaking that concept down into its component parts to show cause and effect*. While the students may leave knowing that plants do in fact grow, there's no indication that the

objective was actually met; the students are unlikely to be able to tell what components cause plant growth.

- In the second scenario, the teacher successfully broke down (atomized?) the concept being taught by discussing the three different models of the atom, but the teacher *taught those models in isolation, without any explanation that there was progress being made as these models evolved over time.* Thus, the students seem to leave able to describe the pieces of the concept, but with no true sense of the over-arching concept demanded by the objective.
- In the third scenario, the teacher provides a perfectly good explanation for some audiences, but not for a fifth grader. The teacher *fails to consider that her audience may lack prerequisite knowledge to understand that explanation*. The student may not understand concepts she used in the explanation, like "low pressure" and vacuum.

All three of these teachers have demonstrated a lack of forethought and insight about how students would receive and process the new information. The second-grade teacher failed to "get into the mind" of the students enough to realize that the information being received in their mind did not match up with the actual demands of the objective. A better teacher would have recognized during the planning of this lesson that this approach would not produce in students' minds a list of factors that help plants grow. Similarly, the ninth-grade teacher failed to "get into the students' minds" sufficiently to realize that they were only receiving a static view of three different concepts without any sense of the longitudinal relationships among those concepts (as required by the objective). Finally, the fifth-grade teacher seems oblivious to the students' starting reference points for the explanation about how planes fly. A more thoughtful teacher would realize that success in this explanation will depend on hooking it, perhaps by analogy, to something the students already understand. (See the Conclusion of this chapter for how a teacher might attempt that difficult challenge.)

These poor examples of teaching are meant to emphasize the deceptively simple idea that the lesson plan structure is not implemented in a vacuum. While a lesson plan template gives you a proven process on which to hang your instructional decisions, it does not answer the very difficult judgment questions that govern what content you impose on that structure. All three of the teachers above might give the same explanations in a perfectly complete lesson plan format, but the students still would not be "getting" the concept in a way that meets the lesson objective.

Excellent teachers think long and hard about their approach to an objective *before* mapping out a lesson plan. Successful teachers—like successful leaders, writers, lawyers, doctors, performers, and counselors—think carefully about their *audience*, asking themselves how to most effectively match up the desired objective with the particular minds that will receive the instruction. Clearly, the same objective might be taught quite differently for two groups of students who have different ages, interests, experiences, and prior knowledge.

In some ways, this chapter is an extension of the "purposefulness" mantra that permeates the *Teaching As Leadership* and the *Instructional Planning & Delivery* texts. We do not randomly select our instructional methods, but rather, we make purposeful choices about methods based on the needs and strengths of our students. In this chapter, we will highlight some of the lessons that learning theory has for a teacher who is trying to "get in the mind" of his or her students in order to inform those instructional choices.

I. Informing Instruction with Your Students' Perspectives

While recognizing the type or types of explanations that you may be giving in a lesson helps you choose instructional strategies, thinking carefully about how those explanations will be *heard* and *received* by your students may be the single most important factor in assuring that your students truly master your objective. Again, the key to students' understanding of your lesson is your understanding of your students—their perspectives, prior knowledge, interests, misconceptions, and thought processes. In a very real sense, this entire text is built on that premise. We must know *how* and *what* our students think in order to most effectively design a lesson that is going to lead them to true mastery of our objectives.

Unfortunately, too many new teachers fail to think about their lessons from a student's perspective—to experience lessons as students would experience them and then consider whether that experience actually comports with the lesson objective. They provide explanations that, for a whole host of reasons, are simply not accessible to students. We saw, for instance, three examples of explanations that missed their marks in the introduction. In each situation (except, perhaps, the third example about how airplanes fly), the students were learning something, but they were not receiving from the lesson what the teacher intended them to receive. If the teacher had been thinking critically about what the students were actually taking away from the lesson, the teacher would have realized that the objective was missed.

Other examples are readily available. Perhaps your explanation of plate tectonics assumes prior geographical knowledge that a classroom of eighth graders simply does not have. Perhaps your explanation of how to outline a persuasive argument presents too many parts too quickly for your second-grade students. Perhaps, without your even realizing it, your explanation of the distributive property was undermined by your sixth-graders' misconception about the meaning of parentheses in a mathematical equation. Perhaps cultural differences between your background and that of your first graders means that they enter your classroom with a different vision of "family" than you do, a fact that simply must have implications for how you present your project-based unit in which students are making books about their families.

Even if only subconsciously, we are naturally inclined to think of *ourselves* as the audience for the lessons we are planning. Because we may have different experiential, knowledge, and cultural reference points from our children, this tendency leads to mismatches between what happens in our minds and what happens in the minds of our students. Excellent teachers, however, work against that natural inclination and are able to step out of their own minds and into the minds of their children, asking themselves constantly, "How will this be received? What will my students hear when I

The Art and Challenges of "Explaining"

The notion of "getting into the students' minds" is closely related to the notion of "explaining" something well. Ensuring that your students truly master your objective begins with a realization of just how difficult "explaining" an idea can be.

Of course, our naiveté is understandable, given that we all have plenty of experience explaining things. We give directions to a stranger who is trying to reach the store; we tell our friend why we have decided to teach; we describe our choices to a waiter. Unfortunately, those day-to-day experiences as "explainers" may give us a false sense of accomplishment and expertise. (Moreover, if we are really honest with ourselves, those explanations are probably rarely actually completely effective. Have you ever realized, seconds after ending the conversation that you just sent a stranger off with bad directions?)

The stakes in those scenarios are rarely as high—and the challenges rarely as complex—as those in the classroom. As one new teachers' guide warns, "The ability to deliver clear and accurate explanations, and especially impromptu ones, does not come naturally to the majority of teachers. It is a skill that you need to deliberately cultivate if you are to become competent."[20]

[20] MacDonald, Robert, and Sean Healy. A *Handbook for Beginning Teachers*. Longman: New York, 1999, p. 166.

say this? What will be going on in their minds as I give this lesson? How should that change my instructional methods and explanations?"

Here, we have attempted to gather several specific approaches that will help you maintain focus on your students' frame of reference. This section will encourage you to:

(1) Break down concepts into an appropriate number of discrete pieces and then put them back together for students in a meaningful way,
(2) Explore and build on students' prior knowledge using "knowledge bridges" such as analogies,
(3) Investigate and embrace students' cultural reference points that may be different from your own,
(4) Uncover students' misperceptions about your subject matter in order to navigate and correct those in your instruction, and
(5) Always consider students' motivation, taking advantage of opportunities to emphasize in an age-appropriate way the functional nature of the objective.

A. Breaking Down Concepts Into an Appropriate Number of Manageable Parts

Successful teachers constantly weigh the conceptual difficulty students may have when they are exposed to a complex idea (such as writing a persuasive essay) and the real limits on the amount of knowledge and number of ideas that students can process at one time (topic sentence, supporting evidence, persuasive tone, sign-posting, closing arguments, etc.). That is, one teacher might (mistakenly) think that if his students read enough models of good persuasive essays, they will "get it," picking up over time on the characteristics that make good writing. Another teacher might break the general concept of "persuasive essay" into twenty-three component parts and teach each of those parts thoroughly, (mistakenly) believing that the students will therefore be able to write a great persuasive essay. Neither teacher's students are actually going to achieve mastery of that objective.

A teacher who is considering the objective from a students' perspective will realize that both instincts have merit—the overall concept of a "persuasive essay" is in fact too complex an idea to teach all at once, and the long list of parsed components of a persuasive essay would be overwhelming to students in most, if not all, grade-levels. One aspect of "getting into your students' minds" is recognizing the amounts of information that can be received and processed by your students at one time.

A similar problem with the same results is that new teachers sometimes fail to realize all the component parts of a concept that they need to teach. They fail to parse the concepts in the first place. Before you teach the distributive property, for example, students have to be taught the role of parentheses in math, the order of operations, how to multiply integers, etc.

I had to teach my seventh graders how to write their own piece of fiction, and I remember the moment I saw a fellow teacher's handout on the "plot map." There it was: the five basic parts of a plot–setting the scene, the problem, the rising action, the climax, and the resolution. I realized my class could learn these basic concepts, then search for them in stories and television shows, and finally write our own plots. I had read thousands of stories before seeing the plot map, but it was that tool that helped me break down the idea of plot into manageable pieces. As a result, I began to devise the equivalent of the plot map in all of the forms of writing I taught.

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In breaking down complex concepts, as a general rule you should limit your key, "take-home" ideas (those central concepts that you would want your student to explain to someone who asks "what did you learn today?") to three to five concepts. Those concepts may certainly have sub-points, but you should force yourself to be able to summarize your lesson in no more than five bullet points.

Of course, the size and quantity of these "pieces" of information is not an exact science and may vary by grade level. While the generalizations made in the cognitive development chapter should give you some guidance, ultimately you have to check for students' understanding constantly, and determine as best you can when students' failure to understand was a result of putting too much on their plate at once.

B. ...And Putting Them Back Together Again

A problem closely related to some new teachers' inclinations to teach a holistic concept without breaking that concept into component parts is some teachers' failure to pull those parts back together in the holistic concept once the atomized pieces are taught. That is, we often put so much energy into figuring out how to parse down a complex concept so that it is manageable that we fail to follow through by bringing all of those pieces back together in the students' minds so that they have a command of the general concept. This problem was a stumbling block for the teacher in the introduction who tried to teach the evolution of our concept of the atom.

If we are really "getting into the students' minds," we would realize that the students may understand each piece of a lesson without mastering the larger, take-home message.

The moment I was teaching 3rd graders how to "borrow" in subtraction, I realized that I had never really understood why we "borrowed" either! I had to teach the concept of how "borrowing" was to actually take 10, or 100 or 1000 from the number to the left and add it to the one on the right. Using base ten blocks and manipulatives allowed them to understand what they were doing, not just how to do the calculation.

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Consider the following description of a creative, but incomplete, lesson:

> Ms. Carson, a ninth grade geography teacher, has written her lesson objective on the board: Students will be able to describe how the greenhouse effect adversely affects the Earth's temperature. When class begins, she shows students two thermometers at the window, one inside a plastic soda bottle and one directly on the sill. She has three different volunteers note and verify the two temperatures and asked the rest of the class to record the data in their notebooks.
>
> She then describes what "solar radiation" and the atmosphere are, and students write down her definitions. She draws a picture of the Earth and its atmosphere on the board, and she shows how both absorb or reflect beams of sunlight and infrared radiation. Students copy down the drawing.
>
> Next, Ms. Carson takes out a series of signs, each with a different chemical symbol on it. She explains that these different chemical combinations, called gases, make up the atmosphere. She notes the different names of the gases and describes how each of these gases are created both naturally and through human activity.
>
> After students take more notes, volunteers check the thermometers and notice a slight difference between the two temperatures. They again record their observations.
>
> Finally, Ms. Carson asks several other students to come to the front of the class and hands each student a sign, representing either the sun, a beam of sunlight, the earth, or one of the gases discussed earlier. She arranges the students to simulate a beam of sunlight hitting the earth's surface and being unable to leave because of the concentration of gases. The teacher summarizes that the students have just witnessed the process of the greenhouse effect. The bell rings.

In some ways, this is a good lesson. It generally follows a lesson plan form. It appeals to various learning styles. Can Ms. Carson be sure, however, that her students understood how the greenhouse effect works? One of her best tools for demonstrating that cause-and-effect idea was the thermometers,

one in a bottle and one not. And yet, Ms. Carson makes no attempt to connect all of the various components of the greenhouse effect that she is demonstrating with the general concept of "greenhouse effect" that is represented by the thermometers experiment. We have little confidence that her students could explain the relation between the diagrams on the board or the signs were that held up and the thermometers. What did the plastic bottle represent? How does that experiment demonstrate what the diagrams and signs are communicating? What was the effect of the beam of light being trapped in the bottle? *How* is that an analogy for the greenhouse effect?

Within these questions lie what *should* have been the "take-home" messages from this lesson. When asked "what did you learn today?" a student *should* have been able to respond:

> The greenhouse effect is a slow warming of the earth that is caused when sunlight enters the earth's atmosphere, bounces off the earth's surface, and then can't escape the atmosphere because of pollutants that humans have put into the air. We proved that this happens by trapping sunlight in a bottle. The plastic of the bottle represented the earth's atmosphere. When we trapped sunlight, the temperature rose, just like what scientists believe is happening on Earth due to pollution.

Ms. Carson, like many new teachers who get wrapped up in the atomized "activities" that they have developed, failed to pull those pieces together in a way that would allow students to meet her objective. You must be wary of the tendency to lose sight of the ultimate purpose of your lesson, and instead explicitly build back up what gets broken apart for the purpose. Similarly, this means considering what students are likely to be thinking about during your lesson. Was the student representing the sun in Ms. Carson's class thinking about solar radiation, or how he looks in front of the rest of the class? This is not to say that you cannot include engaging activities in your classroom, but you may be sacrificing the clarity of your message for unnecessary razzle-dazzle.

As with all of these strategies, the key to successfully avoiding this problem is to put yourself in the place of the students. Ask yourself as you lesson plan whether a student will understand what and why each step in the lesson is happening. Ask yourself whether the "take-home" message of your objective is clear. Without a real synthesis of key ideas, you risk walking your students through a series of specific (perhaps creative) activities without the students ever getting the point.

C. Building on Students' Prior Knowledge

Imagine attempting to teach students the distributive property in a way that truly starts from scratch, without being able to assume any prior knowledge at all. It's a mind-boggling thought experiment. There must be something—addition, multiplication, knowledge of numbers, language itself?—from which to build. Like a geometric proof, all teaching starts with some "given," pieces of prior, familiar knowledge in the student's mind that the teacher invokes as a foundation for the new knowledge that is being taught.

To maximize your effectiveness as a teacher, you have to (1) know what your students' prior knowledge and experiences are and (2) take advantage of them. The first requirement is fulfilled by a combination of general assumptions that you make about students of that age, specific information that you have from student assessments, and other information that you have gleaned from your formal (student interest surveys) and informal (daily conversations) inquiries into your students' lives. These investigations map out the foundation of prior knowledge on which a new teacher can build. Fulfilling the second requirement means thinking about an upcoming objective and students' base of knowledge simultaneously, finding common ground to start from in your quest for mastery of the objective.

Consider the following, relatively simple, illustration of a teacher's use of a student's prior knowledge:

Student: In this story, these boys have a "rivalry." What does that mean?

Teacher: Well, think about your relationship with your older brother Mike. I know you respect and admire him, right? I remember that you wrote about that big fish he caught.

Student: Yes.

Teacher: At the same time, do you ever compete with him? Do you sometimes fight over something, or try to out do each other?

Student: Yes. We fight over the front seat sometimes. And we always compete to jump our bicycles highest.

Teacher: Sometime people call that a "sibling rivalry"—a rivalry is a relationship that involves a lot of tough competition.

Student: Like, maybe, a football game?

Teacher: Absolutely. People often call teams that compete really hard with each other, "rivals." You play soccer. Which team that you play would say is your biggest "rival"?

Student: Probably the Blue Jays. We had an overtime game last time and we won. I bet the next time we play it is really a hard game because they really want to beat us.

Teacher: So, the Blue Jays are your "rival." That's exactly right. They are a team that you have intense competition with. Now, let's think about this word in the story. What does the word "rival" tell you about these boys in your story? . . .

Thus, in terms of cognition, this teacher has adeptly hooked a new word to a concept that the student already had in his mind, a much more successful technique than simply defining the new word for the student. Note that to do so successfully, the teacher had to have a foundation of knowledge about the child's prior experience.

Analogies. One particular form of accessing prior knowledge is the use of analogies. Much like the teacher in the dialogue above, you can sometimes build a "knowledge bridge" from something a student knows and understands to some new concept through carefully chosen analogies. In fact, most of us use these unconsciously all the time. As a teacher, we have to pull this technique into the front of minds, to think deliberately about what analogies are going to be most effective with your students. Again, the starting point of the analogy will depend on students' prior knowledge. Consider these examples:

- "DNA is the shape of a spiral staircase," might be appropriate for younger students, while for twelfth grader who have studied geometry, you might say "DNA is shaped like a double-helix." In both cases, you would realize the need to show a picture.

- For younger students, you might teach the human body's systems in terms of a factory, drawing connections between bones and buildings, between nerves and electrical wires, between muscles and machines, etc. (Of course, such a metaphor would probably too oversimplified for older students, although assigning an older student to write a paper that compares and contrasts the human nervous system to a community's communications systems might be an effective way to develop and check for understanding.)

- With younger children, you might make analogies between the national presidential race and a class-wide election of hall monitor. Save your more abstract comparisons for older students; you might make a three-pronged scale to serve as an analogy for the give-and-take, checks-and-balances relationship among the three branches of government.

Schema, Assimilation, and Accommodation—
Our Brain's Organization of Prior Knowledge
Some theorists suggest that most of the information stored in long-term memory is organized as schemas—organized bodies of knowledge about particular objects or phenomena. Schemas are essentially generalizations that our minds make about categories of ideas. For example, as children, we developed sets of characteristics that we associate with fruit and with vegetables. Probably, at some point, we encountered a more advanced definition of "fruit" and "vegetable," learning that fruits have internal seeds. Suddenly, we have to adjust our schema for fruit to include tomatoes. Schemas become particularly important with children interpreting experiences for the first time. Children might call a whale a "big fish," reflective of the child's schema that all creatures that live in the water are fish. A very young child might call a cat a dog if all four legged creatures she has previously encountered were dogs. As a teacher, we have to be aware of and "accommodate" those schema by helping students reorganize their mental view of an idea, creating more and more sophisticated schema. This concept has broad implications for you as a teacher. In terms of building upon students' prior knowledge, you will need to identify and teach "from" children's existing schema for a given idea. In some cases, your responsibility will be to break down and reinvent the schema children bring to the classroom.

Do keep in mind that an effective "knowledge bridge" has to be initially anchored to a concept that the student knows very well. So, the human body analogies described above might fall flat if your students have no idea how a factory works.

Analogies, metaphors, similes, representations, and word pictures are often excellent means of bridging from students' prior knowledge to a new idea. They must be used, however, with an element of caution. By definition, analogies simplify the concepts you are teaching. You must take care that students do not fail to move from one side of the bridge to the other, thereby coming away thinking that DNA *is* a spiral staircase, for example. The spiral refers to its shape and nothing else. You should make it a habit when using analogies to also discuss the differences between the two objects being compared, although that discussion should probably come after a discussion establishing the analogy has occurred.

D. Learn about Students' Cultural and Experiential Reference Points
No matter what your background, ethnicity, race, gender, sexual orientation, or experience, it is guaranteed to be different from each of your student's. Using that premise as a starting point, you should explore those differences with an eye for students' prior knowledge, reference points, and schema from which you can build additional knowledge. The example about cultural perspectives of "family" is just one, of many. Something as simple as the different meaning of the word "lemon" in Spanish and English can trip up understanding of a story or analogy. Cultural dialects can complicate formal grammar lessons. On a grand scale, the gross under-representation of some students' heritage in some textbooks

can be demeaning and confusing to students, and interfere with your own academic goals for your students if you do not foresee and address that concern. Perhaps you are teaching in a community where the average age of marriage for girls is much younger than the "norm" you have in your mind. How does that fact influence your discussion of a short story about an arranged marriage? Perhaps some of your students have family members in gay relationships? Perhaps most of your students do not? How do those facts inform your discussion of a short story about a close relationship between two men?

Mistakenly, I selected Charlotte's Web *to read with my third graders. I was so excited to be reading a novel with them that was above third grade reading level that I completely forgot to think about how this story could relate to their lives. As we conducted our pre-reading activities, I heard lots of questions. "What's a plow? Why do they have pigs in their backyard? How come Mrs. Arable doesn't have a job?" Wow! I don't know how I overlooked this one! We ended up comparing the lives of Fern and Wilbur with our lives. We wrote a different version of* Charlotte's Web *that would take place in Compton. We were able to make adjustments and talk about different cultures. In the end, it was a successful unit, but it is an example of not thinking strategically about my students and their prior knowledge before planning. Not to say they should not read books like* Charlotte's Web *(they loved the story, and it certainly expanded their horizons), but we needed to talk about some clear differences in order for them to be invested in reading it.*

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Overlaying these larger ethnic, cultural, gender, and sexual orientation reference points are a whole world of experiential reference points that are direct products of students' lives in their communities, families, and schools. Perhaps several of your students come to you from families for whom the "government" (in the form of social workers and police) is a very real presence in their lives. How will the "schema" they have for the concept of "government" play out in your discussion of various *forms* of "government" around the world? Perhaps your students have never traveled outside of their community or state. How will that fact influence your approach to designing d=rt word problems for your math class?

Through the *Diversity, Community and Achievement* text, we will explore the dynamics of difference and sameness between you and your students (and among members of your class) that should be part of your consideration of how to best reach and teach your students. Just as it is your responsibility to explore and build from students' prior knowledge, it is your responsibility to explore and acknowledge your students' life backgrounds in your instruction.

E. Recognizing and Overcoming Students' Misperceptions

A corollary to the principle that you must know and use students' prior knowledge is that you also must be aware of and address students' misperceptions that may affect their reception of your instruction. Inaccurate or absent information can have a significant impact on a student's ability to process new ideas and should be built upon or consciously shifted when explaining a related concept. (As you study Content Pedagogy this summer, you will consider some of the common misperceptions that students of a particular age bring to various classes.)

Consider the following examples of misperceptions that students might bring to a classroom:[21]

Earth Science, Grade Six

Fact:	The earth revolves around the sun.
Misperception:	The sun revolves around the earth. It "rises" in the morning and "sets" in the evening, at which point it "goes" to the other side of the earth.

[21] Ormrod, Jeanne. *Educational Psychology: Developing Learners* (4th Ed). Prentice Hall: New York, 2002.

Language Arts, Grade K

Fact: The /s/ sound can be made by an "s," or a "c."
Misperception: The /s/ sound is made by only by an "s."

Life Science, Grade One

Fact: A living thing is something that carries on such life processes as metabolism, growth, and reproduction.
Misconception: A living thing is something that moves and or grows. The sun, wind, clouds, and fire are living things.

Geography, Grade Eight

Fact: Rivers run from higher to lower elevation.
Misconception: Rivers run from north to south, "down" a map.

In each case, the teacher must foresee those misperceptions in order to most effectively plan a lesson. This is especially important when the teacher is teaching a skill or idea that assumes background knowledge of a particular concept. A lesson that does not take on the misperception will be highly confusing to a child who is trying to reconcile his or her "known" information with this new information presented by the teacher. Even adults have been shown to ignore material that contradicts their prior knowledge – and to actively seek out information that confirms their existing beliefs.[22] Often, the best way to take on these misperceptions is to address them explicitly as part of your lesson.

In order to uncover the root of misunderstandings, teachers should consider exploring the concepts that students have already formed (or mis-formed) in their heads before instruction. In one example, from the book *Learning to Question, Questioning to Learn*, a teacher presents a second grader, Christy, with four sentences.

1. John has a pet snake
2. Do the Power Rangers come on at 4
3. Is the school lunch bad
4. We have Fall break on October 10

Christy is to decide which sentences require question marks. She chooses numbers two, three and four. The teacher attempts to explore why:

Teacher: OK, what makes sentence 2 is a question?
Christy: The Power Rangers come on at 6:00, not 4:00.
Teacher: So what makes that sentence a question?
Christy: They don't come on at 4:00. I was baffled, but I continued.
Teacher: Let's leave sentence number two. What makes sentence number 3 a question?
Christy: I don't think the school lunch is bad. Some kids do.
Teacher: So why does it end with a question mark?
Christy: Because we can't agree.
Teacher: If you don't agree with something, it's a question?
Christy: Yes.
Teacher: Hmm, what about sentence number four, what makes you say that it needs a question mark?
Christy: Fall break is on October 3rd, not on October 10th.

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[22] Holt-Reynolds, D. "Personal history-based beliefs as relevant prior knowledge in course work." *American Educational Research Journal*, 29, 325-349.

The teacher, who has been teaching punctuation marks for five years, found this line of questioning extremely helpful. "I never really probed my students' thinking to find out why they punctuated correctly or incorrectly," she said. "I now realize how valuable this is. … In Christy's case, she was determining if something was true or not. If it was true, then it had to end in a period. If it wasn't true or she was unsure about the answer, then it ended in a question mark."[23] So often, teachers do not take the time to determine *why* a child is not answering questions correctly. The phenomenon of concept formation reminds us to be precise when helping students learn new ideas – and to be investigative when students are not performing as expected.

F. Considering Student Motivations

In each of the other texts, we discuss the importance of motivating students to learn. In most of those cases, we discussed that idea on a macro-level—how one motivates students to want to learn generally. That same principle applies on a lesson-by-lesson case. Successful teachers are also effective at "getting inside their students' minds" enough to know why this particular objective could be enticing to them.

The *Washington Post* asked teachers and students about their most effective or interesting school assignment.[24] Peter Petrossian, a middle school science teacher at Pyle Middle School in Bethesda, captured students' interest with a lesson on DNA fingerprinting:

> It's so common now to either read in a magazine or see on TV how this technique is used to do everything from find a murderer, identify a relative or biological mother or father, or even to identify new species or genes. The kids get a make-believe scenario where a little old lady's dog (Poopie) has been dog-napped and they need to solve the crime: "Who stole Poopie?" They get real vials of DNA (found at the scene of the crime and obtained from the suspects). They set up the equipment, make all the solutions and gels, and run the experiment. Then they analyze their results and solve the crime. Twenty years ago, these procedures weren't even available to anybody -- now I've got 7th graders doing it!

You would probably need to write a grant to obtain the equipment necessary to execute such a lesson. But if you did, you would surely be giving your students an educational experience they would never forget. Meanwhile, with most motivating lessons, you don't need money—just a creative spin. Successful lessons tap into students' sense of curiosity and interest in investigation. Ben Kraftchick, a seventh grader at the Gulliver Academy in Miami, told the *Post* how much he enjoyed preparing for a Halloween debate assigned in speech and debate class.

> This debate was going to determine the greatest of the three classic movie monsters: Frankenstein's monster, Dracula, and the Werewolf. I represented Frankenstein. In support of my contention that Frankenstein was the most powerful, I pointed out: (1) His powers are not limited to specific times; Dracula is powerful only at night and the Werewolf only on the full moon. (2) If Frankenstein were actually attacked and bitten by one of the others, he would gain their powers, in addition to his own. (3) Frankenstein is reparable. Even if he is severely injured and even killed, all you need is a mad scientist (of which there are plenty in the movies) to repair him. If you were representing Dracula, you might point out that he has the power of hypnotism with which to control the other two monsters, as well as immortality (absent a wooden stake, of course) and the ability to create other vampires. With enough vampires, you could overcome Frankenstein. If you

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[23] Dantonio, Marylou. *Learning to Question, Questioning to Learn.* Boston: Allyn and Bacon, 2001, p. 179.
[24] Strauss, Valerie. "Effective Assignments, From DNA to Dracula," *Washington Post*, January 5, 2004.

> were representing the Werewolf, you might point out his superior strength and ability to turn others into werewolves. Again, with his strength and fellow werewolves, he could overcome Frankenstein.

Successful teachers often also stress the functional aspects of the new skills or knowledge so that students recognize the usefulness of mastering that objective. Students more quickly and efficiently grasp explanations that they view as directly bearing on something they are trying to do or do better. (This point is closely connected to the *Teaching As Leadership* model's focus on investing students in their academic goals. Once students are invested in their own success, these day-to-day motivations become considerably easier.) While it can be easily argued that students should learn to appreciate certain knowledge simply for its beauty and pleasure, MacDonald and Healy emphasize the need to connect learning to the students' vision of usefulness:

> When students don't see any usefulness in what they are learning, you should work to build the use of it into your explanations. The younger the students, the more need there is to make explicit the functional and operational dimensions of all new learning. Teacher explanations should tell students: "This is how it works," "this is what you do with it," "this is the need it helps us to satisfy." Always aim to have students perceive that what they are learning has an identifiable use.[25]

If you are teaching students how to derive the area of a space, develop work problems that are based on real spaces that students are interested in. What is the area of the classroom? Of their room? Of the gym? Of the school? If you are working on writing objectives, create products that will be "published" in a way that shows writing's usefulness. Write letters to local politicians who will then come to class. Write books that can be shared with family. Through it all, you should also be reinforcing messages about the long-term value of these skills in terms of increased opportunities after school.

Conclusion and Key Concepts

If the three teachers in the introduction had been more deliberate in "getting into their students' minds" as they designed their lesson plans, their lessons would have been more successful. If these teachers had first recognized the weighty difficulty of "explaining" a concept, and had then thought critically about their students' prior knowledge, cultural backgrounds, experiential reference points, and potential misperceptions about the subject matter, the students in their classrooms would have been more likely to have truly mastered the objective.

The first teacher, for example, would have isolated the influences of sun, water, and nutrients, perhaps conducting experiments with controls for those various factors, allowing the students to discover that the absence of any of those factors undermines growth. In the second example, if the teacher had viewed the lesson from the students' perspective, the teacher would have realized that the lesson was teaching pieces of the desired objective, but not the objective itself. The teacher would have involved the students in drawing out similarities and differences among the three models, to show the evolution over time.

The third teacher, facing the difficult question about how planes fly, would have thought about a fifth grader's frame of reference and would certainly not have recited an answer that he or she learned in college. Instead, the teacher would have thought about ways to reach the knowledge by building on what a fifth grader knows. For example, the teacher might first tear a strip of paper from a notebook, asking the child to hold one end of the strip just under her mouth as she blows across the top of it. When the

[25] MacDonald, Robert, and Sean Healy. A *Handbook for Beginning Teachers*. Longman: New York, 1999, p. 174.

paper rises upward, the teacher would explain that when air goes faster over the top than the bottom of something, it pulls the object upward. Having "proven" that fact to the child and made sure the child understood that point, the teacher might say "So, the real question here is why is it that air moves faster over the top of an airplane wing than under it?" Using some diagrams on the board—and better yet some student running around a giant profile of a wing on the playground, the teacher would next demonstrate that air has to travel farther and therefore travel faster over the top of the plane's wing because of its shape. (Not an easy concept for a fifth grader, but doable!)

As a teacher concerned with your students' mastery of your objectives, you must invest considerable time and energy in thinking about how your students will hear, see, and receive the information that you are presenting. What, in their minds, is the starting point for the discussion? Is that starting point a useful platform for you to build from or is it a dangerous misconception that could undermine the rest of your lesson? Few teachers are able to lead their students to significant academic gains without "getting into students' minds" while they plan their instruction.

Having read this chapter, you should recognize that the key to "getting in the mind" of your students is to inform your instruction with student perspectives by:

- Breaking down concepts into manageable parts
- Re-synthesizing those parts to teach students the overall concept
- Building on students' prior knowledge
- Considering students' cultural and experiential reference points
- Recognizing and overcoming students' misperceptions
- Considering student motivations